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APPLICANT : HITACHI ELECTRON ENG CO LTD;

INVENTOR : NIREI TAKASHI;

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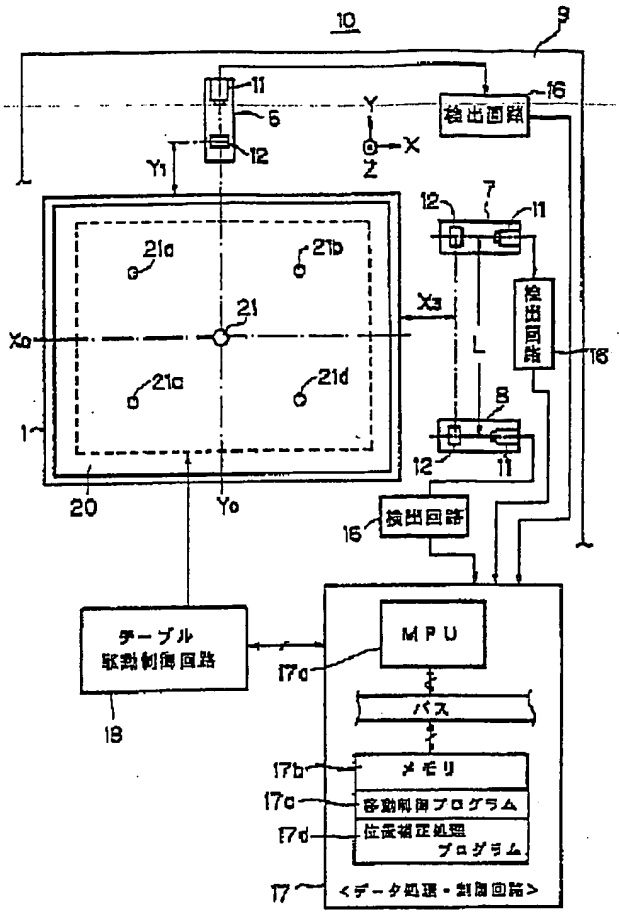
TITLE : DEVICE FOR POSITIONING RECTANGULAR SUBSTRATE



ABSTRACT : PROBLEM TO BE SOLVED: To provide compensating amounts in the directions of X and Y by obtaining the moving amounts of three points up to reference values by the respective edge sensors by relative movement through an XYθ stage.

SOLUTION: A chuck table 20 is set at an initial position. Next, a LCD panel 1 is mounted on the chuck table 20 and is adsorbed/held. The chuck table 20 is moved to edge sensors 7, 8 at a constant speed in the X direction. When a edge detection signal is obtained from either of the edge sensors 7, 8, the moving amount of the chuck table 20 at the moment is stored on the storage position according to the detected signal. The rotating amount θ and the compensation of X axis are performed. Then, the chuck table 20 is moved at a constant speed to an edge sensor 6 in Y direction. The moving amount from an origin i.e., Y1 as the Y coordinate is stored on the stored position of the edge sensor 6. The chuck table 20 is moved by-Y1 in Y direction for the compensating Y axis.

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CLAIMS

[Claim(s)]
[Claim 1] In the pointing device of the rectangle substrate which positions to a position the rectangle substrate laid on XYtheta stage in which 2-dimensional migration and rotation of XY are possible to the optical system established in this stage upper part The 1st edge sensor which is arranged in the criteria location of X of said XYtheta stage, and either of the Y, is held on said XYtheta stage, and detects optically the edge of one side of the rectangle of said substrate, X of said XYtheta stage, and either of the Y -- the criteria location of another side -- and with the 2nd and 3rd edge sensor which detects optically the edge of one side of everything but predetermined that distance detached building ****** is carried out, is held on said XYtheta stage, and intersects perpendicularly with said one side of said substrate in one [said] direction Each movement magnitude until it moves said substrate toward said 1st, 2nd, and 3rd edge sensor relatively from a predetermined initial valve position and said each edge is detected in response to the detecting signal from said 1st, 2nd, and 3rd edge sensor is obtained. The pointing device of a rectangle substrate equipped with a location amendment means to amend the include angle of said XYtheta stage, and each location of the direction of X, and the direction of Y from these movement magnitude to said initial valve position.
[Claim 2] Said substrate is a liquid crystal panel or its glass substrate. Said 1st, 2nd, and 3rd edge sensor It is what detects said edge by generating a beam in the direction perpendicular to said substrate front face, and this beam being intercepted. The 1st edge sensor It is arranged substantially at said mid gear of one side. The 2nd and 3rd edge sensor Only said predetermined distance L separates in the location which becomes symmetrical with the mid gear of one side, and is arranged in it, and said initial valve position is a zero. substantial -- said -- others -- said location amendment means Move said substrate toward said 2nd and 3rd edge sensor relatively from a predetermined criteria location, and each movement magnitude A1 and A2 is obtained. An angle of rotation is acquired by theta=arctan {(A1-A2) /L}. However, L performs said predetermined distance) and location amendment of the direction which is in agreement in this migration direction after this performs angle correction for -theta. (-- Next, the pointing device of the rectangle substrate according to claim 1 which is made to move said substrate toward the direction of said 1st sensor, obtains said movement magnitude, and performs location amendment of this direction.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the pointing device which can perform positioning of a large-sized liquid crystal panel in the state of non-contact in detail about the pointing device of a rectangle substrate.
[0002]
[Description of the Prior Art] A large-sized thing is developed and the liquid crystal panel is used abundantly in every direction by the advance of a technique. A liquid crystal panel (only henceforth the LCD panel) is inspected with test equipment in the phase where the minute pixel was formed in the front face in the shape of a matrix, patterns, such as a thin film transistor, and resistance, a capacitor, a pixel electrode, were formed on the glass substrate by the aligner, and each pattern was formed. In an aligner or test equipment, the chuck table which lays the LCD panel and a glass substrate is prepared, and thereby, the LCD panel 1 is adsorbed and is held. X, Y, and Z migration device are prepared in this chuck table bottom, and, for exposure optical system, inspection optical system is ********** at test equipment with an aligner above a chuck table. And the LCD panel is positioned so that the core of the LCD panel 1 may be in agreement with the center position of these optical system. Moreover, there is a control system which carries out migration control of the chuck table as a control system apart from these.
[0003] About a rectangle (300mm and 400mm), the dimension with a large-sized LCD panel in every direction is nothing, and the thickness d is about 1mm. The LCD panel uses a glass substrate as the base fundamentally, and the pattern which consists of the above mentioned thin film transistor, resistance, a capacitor, a pixel electrode, etc. with a FOTORISO graphic method is formed to the front face by the TFTLCD panel. In addition, here represents and explains with the LCD panel also including the glass substrate before pattern formation on account of explanation.
[0004] Drawing 5 is a top view centering on the chuck table of the conventional exposure stage or an inspection stage, the LCD panel 1 is laid in the chuck table 2, and the positioning device 5 over the LCD panel 1 is formed in the perimeter. 1A, 1B, and two shorter sides are set to 1C and 1D for two long sides of the LCD panel 1, and suppose a long side that the direction of X and the shorter side were laid as a direction of Y. Positioning air cylinder 5a which has Stoppers Sta and Stb to long side 1A, respectively, and 5b They are [as opposed to / again / long side 1B] press air cylinder 5c and 5d. It is arranged, respectively. air cylinder 5a, 5c, and 5b 5d respectively -- the line of action C1 of the direction of Y, and C2 the point of application of the LCD panel [as opposed to / are upwards and / such thrust or reaction force] 1 -- pa, pc and pb, and pd it is . positioning air cylinder 5e which has Stopper Ste to shorter sides 1C and 1D on the other hand Press air cylinder 5f Line of action C3 of the direction of X it arranges upwards, respectively -- having -- the point of application of the force -- pe and pf it is .
[0005] positioning of the LCD panel -- setting -- first -- each -- air cylinder 5a -5f It operates to an opposite direction, each press rod (gage pin) 51 is shunted, and it conveys according to the handling device in which the LCD panel 1 subsequently is not illustrated, and lays in the near location of the installation base 2. Here, they are each positioning air cylinder 5a and 5b. And 5e If it operates, each gage pin 51 will move and each tip will stop in a fixed positioning location with Stoppers Sta, Stb, and Ste. Subsequently, each press air cylinder 5c and 5d And 5f By actuation, each gage pin 51 is the point of application pc of long side 1B and shorter side 1D, pd, and pf. It presses, and the LCD panel 1 moves and is positioned by the condition of illustration. In addition, positioning of the core of the LCD panel over the core of the optical system especially at the time of exposure is called PURIARAIMENTO, and more exact positioning is performed with reference to the alignment mark formed in LCD panel top 1, after this center position arrangement is completed.
[0006]
[Problem(s) to be Solved by the Invention] Now, on inspection or the focus to the optical system 4 of exposure, since it

is required, the front face of the above-mentioned chuck table 2 is made very flat and smooth. On the other hand, the large-sized LCD panel 1 is stuck to this, when thickness d is laid comparatively [with a large area] by the chuck table 2 since it is thin as described above, and among both, quite large frictional resistance produces it. Supposing the LCD panel 1 carries out an include-angle gap and is now laid to the XY direction, the LCD panel 1 will not move for this frictional resistance, therefore include-angle gap will not be amended. Drawing 6 explains this point. Suppose that the LCD panel 1 was inclined and laid in right-hand side in drawing 6 . First, each positioning air cylinder 5a, 5b, and 5e Actuation stops the tip of each gage pin 51 in a positioning location. Subsequently, each press air cylinder 5c, 5d, and 5f By actuation, the LCD panel 1 is point of application pc, pd, and pf. It is pressed, and moves and they are point of application pa and pe. It contacts and stops to a gage pin 51. However, since frictional resistance is large, the LCD panel 1 does not rotate, therefore it is point of application pb. It will be in the condition of the estranged illustration. That is, include-angle gap deltatheta is not amended. Although the above is the case where the LCD panel 1 inclines on right-hand side, as well as the above when it inclines on left-hand side, include-angle gap is not amended.

[0007] Furthermore, in the relation in which a locator pin 51 is contacted to the end face of the LCD panel 1, the resist near an edge peels or a chipping (lack) occurs at the edge. Peeling of a resist causes raising dust and a chipping causes defect generating. The purpose of this invention is to solve the trouble of such a conventional technique and offer the pointing device of the rectangle substrate which can perform positioning of rectangle substrates, such as the LCD panel, in non-contact.

[0008]

[Means for Solving the Problem] The description of the pointing device of the rectangle substrate of this invention for attaining such a purpose The 1st edge sensor which is arranged in the criteria location of X of XYtheta stage, and either of the Y, is held on XYtheta stage, and detects the edge of one side of the rectangle of a substrate optically, X of XYtheta stage, and either of the Y -- the criteria location of another side -- and with the 2nd and 3rd edge sensor which detects optically the edge of one side of everything but predetermined that distance detached building ****** is carried out, is held on XYtheta stage, and intersects perpendicularly with the one aforementioned side of a substrate in one direction Each movement magnitude until it moves a substrate toward the 1st, 2nd, and 3rd edge sensor relatively from a predetermined initial valve position and each edge is detected in response to the detecting signal from the 1st, 2nd, and 3rd edge sensor is obtained. It has a location amendment means to amend the include angle of XYtheta stage, and each location of the direction of X, and the direction of Y from these movement magnitude to the aforementioned initial valve position.

[0009]

[Embodiment of the Invention] Although a rectangle substrate is the LCD panel in the example, this is not limited to the LCD panel. As long as it is the substrate arranged on XYtheta stage of test equipment or an aligner, the substrate of the ceramics, the substrate of synthetic resin, etc. may be things [like]. In addition, in the example, it is the XYZtheta stage which added the Z stage in addition to XYtheta stage. If the edge sensor arranged around [outside] XYtheta stage is the sensor which can detect the edge of the side of a substrate optically, since it is detectable in the state of non-contact, it asks neither a transparency form nor a reflex. Moreover, although the example shows the example which the edge sensor is being fixed and XYtheta stage side moves in the XY direction, respectively, a configuration which makes XYtheta stage side immobilization and the edge sensor of the direction of X and the direction of Y moves in each direction may be taken. If it is in the invention in this application, an optical edge sensor is arranged as mentioned above in the criteria location where this side corresponding to one side of a substrate should be positioned. Since he is trying to arrange two edge sensors in the criteria location where the other sides corresponding to other one side of a substrate should be positioned The movement magnitude of three points to the criteria location which has each edge sensor by relative migration of the substrate through XYtheta stage can be obtained, and, thereby, the amount of amendments of an angle of rotation, the direction of X, and the direction of Y can be obtained. Moreover, since this amount of amendments is obtained by non-contact, the resist near an edge cannot generate peeling easily and it is hard to produce raising dust. Furthermore, there is also almost no generating of the poor chipping by positioning.

[0010]

[Example] Drawing 1 is a top view centering on the chuck table of the exposure stage of the large-sized LCD panel of one example which applied the positioning device of the substrate of this invention, and drawing 2 is the top view of the chuck table for LCD panel positioning with that side elevation and drawing 3 small [the flow chart of the positioning processing for LCD panels, and drawing 4]. In drawing 1 , 10 is an exposure stage and the LCD panel 1 is laid in the chuck table 20. Although the conventional chuck table 2 of drawing 5 turns one and is a big chuck table as an edge is arranged outside that edge of the LCD panel 1, this chuck table 20 is somewhat smaller than the LCD panel 1, and that magnitude is different in the chuck table 2 at the point which the edge of the LCD panel 1 has protruded outside.

Moreover, in order to adsorb the LCD panel 1, the adsorption holes 21a, 21b, 21c, and 21d are formed in the center section at the adsorption hole 21 and the mid gear of each area divided into two in all directions, respectively, and as shown in drawing 2 , the XYZtheta migration stage 3 where thetaZ rotation device 3b was accumulated on XY migration device 3a is established in the chuck table 20 at the rear-face bottom of this chuck table 20. In addition, by showing this XYZtheta migration stage 3 in JP,7-83793,A (Japanese Patent Application No. No. 252318 [five to]) which is application by the applicant for this patent, since it is well-known, that detail is already omitted.

[0011] So that the core may be in agreement with the center line Yo of the direction of Y which passes along the adsorption hole 21, if it is located at the core of the chuck table 20, and the XYZ direction is set up so that it may illustrate as an alternate long and short dash line shows the adsorption hole 21 to drawing 1 The edge detection optical sensor (following edge sensor) 6 of the direction of Y is formed so that the edge of the detection location of the LCD panel 1 may correspond with the criteria location (location where the edge of the direction of Y of the LCD panel 1 should be essentially positioned in the direction of Y) of the direction of Y by ****** detached building ******. Moreover, it is prepared so that the edge of the edge sensors 7 and 8 of the direction of X of the LCD panel 1 may correspond with the center line Xo of the direction of X which passes along the adsorption hole 21 by ****** detached building ****** in the criteria location (location where the edge of the direction of X of the LCD panel 1 should be essentially positioned in the direction of X) of the direction of X at the symmetry. Distance of the detection location of these edge sensors 7 and 8 is set to L here. Edge sensors 6, 7, and 8 are attached in the base 9 which is fixing the chuck table 20, respectively. And when each one side of the direction of X of the LCD panel 1 and the direction of Y is in agreement with the detection location of said edge sensor, it comes to be in agreement with the core of the exposure optical system 4 (refer to drawing 2) that the core has been arranged in the upper part at the LCD panel 1, and, thereby, positioning of the LCD panel 1 is completed. Especially, thereby in an aligner, PURIARAIMENTO of the LCD panel 1 is completed.

[0012] The configuration of edge sensors 6, 7, and 8 is that irradiated the laser beam perpendicularly to the field of the LCD panel 1, and the exposure light was intercepted. As the location is detected and an edge sensor 8 is shown in drawing 2 as a representative, these edge sensors The laser light source 11 by the semiconductor device which is arranged in a location higher than the front face of the chuck table 20, and irradiates a beam horizontally, It is arranged in a location lower than the rear face of the up mirror 12 and the chuck table 20 which are horizontal, receive the beam of a laser light source 11, and reflect this perpendicularly. It consists of the lower mirror 13 which reflects this horizontally in response to the beam from the up mirror 12, a photo detector 14 which receives the beam from the lower mirror 13, and a frame 15 of the typeface of KO which supports these.

[0013] The detecting signal of a photo detector 14 is sent out to data processing and a control circuit 17 through the detectors 16, 16, and 16 prepared corresponding to each sensor. It consists of amplifier (AMP) 16a and comparator (COM) 16b to which a detector 16 amplifies the detecting signal of a photo detector 14 as shown in drawing 2 , and comparator 16b generates an edge detecting signal, when the output of amplifier 16a becomes below a reference value. While data processing and a control circuit 17 consist of MPU17a, memory 17b, etc. and receiving an edge detecting signal from comparator 16b, the signal from the CCD sensor (not shown) of the detection exposure optical system 4 arranged in the upper part of the chuck table 20 for inspection etc. is received. Moreover, the control signal for carrying out specified quantity migration of the XYZtheta migration stage 3 is sent out to the table drive control circuit 18. Migration control program 17c and 17d of location amendment processing programs which control the XYZtheta migration stage 3 are formed in memory 17b.

[0014] Next, positioning processing of the LCD panel 1 is explained according to drawing 3 . First, the chuck table 20 is set as an initial valve position (home position) (step 100). Next, the LCD panel 1 is laid in the chuck table 20, and carries out adsorption maintenance of this (step 101). And migration control program 17c is performed and the chuck table 20 is moved in the direction of X by fixed speed toward edge sensors 7 and 8 (step 102). Next, MPU17a of data processing and a control circuit 17 enters the waiting loop formation for a signal from edge sensors 7 and 8 (step 103). If an edge detecting signal is obtained from either of the edge sensors 7 and 8, according to the edge detecting signal, the movement magnitude of the chuck table 20 at that time will be memorized to the storage location corresponding to the sensor by which the edge detecting signal of memory 17b was obtained. For example, as the movement magnitude from the zero, i.e., an X coordinate value from the zero, if the edge detecting signal was obtained from the edge sensor 7, X1 is memorized to the storage location FX1 of an edge sensor 7 (step 104).

[0015] Next, the waiting loop formation for a signal is again entered from edge sensors 7 and 8 (step 105). An edge detecting signal is obtained from either of the edge sensors 7 and 8 like the above. In this example, the edge detecting signal of an edge sensor 8 is obtained shortly, and the movement magnitude of the chuck table 20 at that time is memorized according to this to the storage location corresponding to the sensor by which the edge detecting signal of

memory 17b was obtained (step 106). At this time, from an edge sensor 8, since it is an edge detecting signal, X2 is memorized to the storage location FX2 of an edge sensor 8 as the movement magnitude, i.e., that X coordinate value, from that zero. And the chuck table 20 is returned to an initial valve position (step 107), and the following formula amends a rotation theta.
It asks for theta by theta=arctan {(X1-X2) /L}, and the chuck table 20 is rotated by -theta (step 108). However, L is the distance of an edge sensor 7 and an edge sensor 8. Furthermore, the following formula performs X stem correction. The amount X3 of amendments is calculated by X= (X1+X2) / 2, and the chuck table 20 is moved to X shaft orientations for -X 3 minutes (step 109).
[0016] In the location of the chuck table 20, the chuck table 20 is moved in the direction of Y by fixed speed toward an edge sensor 6 after this X stem correction (step 110). And MPU17a of data processing and a control circuit 17 enters the waiting loop formation for a signal from an edge sensor 6 (step 111). If the edge detecting signal was obtained from the edge sensor 6, Y1 is memorized to the storage location FY1 of an edge sensor 6 as the movement magnitude, i.e., the Y coordinate value, from the zero (step 112). And the chuck table 20 is moved to Y shaft orientations as Y stem correction for -Y 1 minute (step 113). It means that the location for which it asked by the above turns into an original home position, and the LCD panel 1 was positioned for the core of the LCD panel 1 in accordance with the core of the exposure optical system 4 (PURIARAIMENTO).
[0017] Drawing 4 is the example of the chuck table which can also position the LCD panel 1 smaller than the magnitude of the chuck table 20. Chuck table 20a According to the size of the small LCD panel 1, the long holes 22a and 22b of the direction of X for passing the beam of edge sensors 6, 7, and 8 and the long holes 22c and 22d of the direction of Y are formed along each side of X and the direction of Y, respectively. When the die length of the long holes 22a and 22b of the direction of X considers a forward negative direction, it is a twice [more than] as many thing as the maximum of the amount of amendments of a Y-axis, and long holes [of the direction of Y / 22c and 22d] die length is a twice [more than] as many thing as the maximum of the amount of amendments of the X-axis similarly. Moreover, as shown in drawing 2 , since eight are the typeface of edge sensors 6, 7, andKO, the beam for edge detection can enter to an aforementioned long holes [22a-22d] location. Or the die length of the arm part by the side of the tip of the character of KO has become [the up mirror 12 and the lower mirror 13] for a long time so that may be supported, so that it may be made.
[0018] In the example, although explained above, although edge sensors 6, 7, and 8 are considered as immobilization, it can combine with a migration device and edge sensor 6 and 7 and 8 side can be moved for chuck table 20a to a zero in the state of immobilization so that these may be moved in accordance with each shaft. Thereby, each coordinate value X1, X2, and Y1 may be obtained. In addition, when moving a sensor side in this way, these values can also be acquired to coincidence and, thereby, the time amount of amendment processing is shortened. Moreover, although a sensor here makes a light beam penetrate and detects an edge by cutoff of the beam, a sensor which detects the scattered reflection light of an edge by the photo sensor of a reflex can also be used for it. Furthermore, X in an example and Y are relative and the direction of X and the direction of Y may be replaced.
[0019]
[Effect of the Invention] If it is in the pointing device of the rectangle substrate by this invention as the above explanation Since an optical edge sensor is arranged in the criteria location where this side corresponding to one side of a substrate should be positioned and he is trying to arrange two edge sensors in the criteria location where the other sides corresponding to other one side of a substrate should be positioned The movement magnitude of three points to the criteria location which has each edge sensor by relative migration of the substrate through XYtheta stage can be obtained, and, thereby, the amount of amendments of an angle of rotation, the direction of X, and the direction of Y can be obtained. Moreover, since this amount of amendments is obtained by non-contact, the resist near an edge cannot generate peeling easily and it is hard to produce raising dust. Furthermore, there is also almost no generating of the poor chipping by positioning.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the pointing device which can perform positioning of a large-sized liquid crystal panel in the state of non-contact in detail about the pointing device of a rectangle substrate.

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PRIOR ART

[Description of the Prior Art] A large-sized thing is developed and the liquid crystal panel is used abundantly in every direction by the advance of a technique. A liquid crystal panel (only henceforth the LCD panel) is inspected with test equipment in the phase where the minute pixel was formed in the front face in the shape of a matrix, patterns, such as a thin film transistor, and resistance, a capacitor, a pixel electrode, were formed on the glass substrate by the aligner, and each pattern was formed. In an aligner or test equipment, the chuck table which lays the LCD panel and a glass substrate is prepared, and thereby, the LCD panel 1 is adsorbed and is held. X, Y, and Z migration device are prepared in this chuck table bottom, and, for exposure optical system, inspection optical system is ********** at test equipment with an aligner above a chuck table. And the LCD panel is positioned so that the core of the LCD panel 1 may be in agreement with the center position of these optical system. Moreover, there is a control system which carries out migration control of the chuck table as a control system apart from these.
[0003] About a rectangle (300mm and 400mm), the dimension with a large-sized LCD panel in every direction is nothing, and the thickness d is about 1mm. The LCD panel uses a glass substrate as the base fundamentally, and the pattern which consists of the above mentioned thin film transistor, resistance, a capacitor, a pixel electrode, etc. with a FOTORISO graphic method is formed to the front face by the TFTLCD panel. In addition, here represents and explains with the LCD panel also including the glass substrate before pattern formation on account of explanation.
[0004] Drawing 5 is a top view centering on the chuck table of the conventional exposure stage or an inspection stage, the LCD panel 1 is laid in the chuck table 2, and the positioning device 5 over the LCD panel 1 is formed in the perimeter. 1A, 1B, and two shorter sides are set to 1C and 1D for two long sides of the LCD panel 1, and suppose a long side that the direction of X and the shorter side were laid as a direction of Y. Positioning air cylinder 5a which has Stoppers Sta and Stb to long side 1A, respectively, and 5b They are [as opposed to / again / long side 1B] press air cylinder 5c and 5d. It is arranged, respectively. air cylinder 5a, 5c, and 5b 5d respectively -- the line of action C1 of the direction of Y, and C2 the point of application of the LCD panel [as opposed to / are upwards and / such thrust or reaction force] 1 -- pa, pc and pb, and pd it is . positioning air cylinder 5e which has Stopper Ste to shorter sides 1C and 1D on the other hand Press air cylinder 5f Line of action C3 of the direction of X it arranges upwards, respectively -- having -- the point of application of the force -- pe and pf it is .
[0005] positioning of the LCD panel -- setting -- first -- each -- air cylinder 5a -5f It operates to an opposite direction, each press rod (gage pin) 51 is shunted, and it conveys according to the handling device in which the LCD panel 1 subsequently is not illustrated, and lays in the near location of the installation base 2. Here, they are each positioning air cylinder 5a and 5b. And 5e If it operates, each gage pin 51 will move and each tip will stop in a fixed positioning location with Stoppers Sta, Stb, and Ste. Subsequently, each press air cylinder 5c and 5d And 5f By actuation, each gage pin 51 is the point of application pc of long side 1B and shorter side 1D, pd, and pf. It presses, and the LCD panel 1 moves and is positioned by the condition of illustration. In addition, positioning of the core of the LCD panel over the core of the optical system especially at the time of exposure is called PURIARAIMENTO, and more exact positioning is performed with reference to the alignment mark formed in LCD panel top 1, after this center position arrangement is completed.

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EFFECT OF THE INVENTION

[Effect of the Invention] If it is in the pointing device of the rectangle substrate by this invention as the above explanation Since an optical edge sensor is arranged in the criteria location where this side corresponding to one side of a substrate should be positioned and he is trying to arrange two edge sensors in the criteria location where the other sides corresponding to other one side of a substrate should be positioned The movement magnitude of three points to the criteria location which has each edge sensor by relative migration of the substrate through XYtheta stage can be obtained, and, thereby, the amount of amendments of an angle of rotation, the direction of X, and the direction of Y can be obtained. Moreover, since this amount of amendments is obtained by non-contact, the resist near an edge cannot generate peeling easily and it is hard to produce raising dust. Furthermore, there is also almost no generating of the poor chipping by positioning.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Now, on inspection or the focus to the optical system 4 of exposure, since it is required, the front face of the above-mentioned chuck table 2 is made very flat and smooth. On the other hand, the large-sized LCD panel 1 is stuck to this, when thickness d is laid comparatively [with a large area] by the chuck table 2 since it is thin as described above, and among both, quite large frictional resistance produces it. Supposing the LCD panel 1 carries out an include-angle gap and is now laid to the XY direction, the LCD panel 1 will not move for this frictional resistance, therefore include-angle gap will not be amended. Drawing 6 explains this point. Suppose that the LCD panel 1 was inclined and laid in right-hand side in drawing 6 . First, each positioning air cylinder 5a, 5b, and 5e Actuation stops the tip of each gage pin 51 in a positioning location. Subsequently, each press air cylinder 5c, 5d, and 5f By actuation, the LCD panel 1 is point of application pc, pd, and pf. It is pressed, and moves and they are point of application pa and pe. It contacts and stops to a gage pin 51. However, since frictional resistance is large, the LCD panel 1 does not rotate, therefore it is point of application pb. It will be in the condition of the estranged illustration. That is, include-angle gap deltatheta is not amended. Although the above is the case where the LCD panel 1 inclines on right-hand side, as well as the above when it inclines on left-hand side, include-angle gap is not amended.
[0007] Furthermore, in the relation in which a locator pin 51 is contacted to the end face of the LCD panel 1, the resist near an edge peels or a chipping (lack) occurs at the edge. Peeling of a resist causes raising dust and a chipping causes defect generating. The purpose of this invention is to solve the trouble of such a conventional technique and offer the pointing device of the rectangle substrate which can perform positioning of rectangle substrates, such as the LCD panel, in non-contact.

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MEANS

[Means for Solving the Problem] The description of the pointing device of the rectangle substrate of this invention for attaining such a purpose The 1st edge sensor which is arranged in the criteria location of X of XYtheta stage, and either of the Y, is held on XYtheta stage, and detects the edge of one side of the rectangle of a substrate optically, X of XYtheta stage, and either of the Y -- the criteria location of another side -- and with the 2nd and 3rd edge sensor which detects optically the edge of one side of everything but predetermined that distance detached building ****** is carried out, is held on XYtheta stage, and intersects perpendicularly with the one aforementioned side of a substrate in one direction Each movement magnitude until it moves a substrate toward the 1st, 2nd, and 3rd edge sensor relatively from a predetermined initial valve position and each edge is detected in response to the detecting signal from the 1st, 2nd, and 3rd edge sensor is obtained. It has a location amendment means to amend the include angle of XYtheta stage, and each location of the direction of X, and the direction of Y from these movement magnitude to the aforementioned initial valve position.
[0009]
[Embodiment of the Invention] Although a rectangle substrate is the LCD panel in the example, this is not limited to the LCD panel. As long as it is the substrate arranged on XYtheta stage of test equipment or an aligner, the substrate of the ceramics, the substrate of synthetic resin, etc. may be things [like]. In addition, in the example, it is the XYZtheta stage which added the Z stage in addition to XYtheta stage. If the edge sensor arranged around [outside] XYtheta stage is the sensor which can detect the edge of the side of a substrate optically, since it is detectable in the state of non-contact, it asks neither a transparency form nor a reflex. Moreover, although the example shows the example which the edge sensor is being fixed and XYtheta stage side moves in the XY direction, respectively, a configuration which makes XYtheta stage side immobilization and the edge sensor of the direction of X and the direction of Y moves in each direction may be taken. If it is in the invention in this application, an optical edge sensor is arranged as mentioned above in the criteria location where this side corresponding to one side of a substrate should be positioned. Since he is trying to arrange two edge sensors in the criteria location where the other sides corresponding to other one side of a substrate should be positioned The movement magnitude of three points to the criteria location which has each edge sensor by relative migration of the substrate through XYtheta stage can be obtained, and, thereby, the amount of amendments of an angle of rotation, the direction of X, and the direction of Y can be obtained. Moreover, since this amount of amendments is obtained by non-contact, the resist near an edge cannot generate peeling easily and it is hard to produce raising dust. Furthermore, there is also almost no generating of the poor chipping by positioning.

[Translation done.]

* NOTICES *

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EXAMPLE

[Example] Drawing 1 is a top view centering on the chuck table of the exposure stage of the large-sized LCD panel of one example which applied the positioning device of the substrate of this invention, and drawing 2 is the top view of the chuck table for LCD panel positioning with that side elevation and drawing 3 small [the flow chart of the positioning processing for LCD panels, and drawing 4]. In drawing 1 , 10 is an exposure stage and the LCD panel 1 is laid in the chuck table 20. Although the conventional chuck table 2 of drawing 5 turns one and is a big chuck table as an edge is arranged outside that edge of the LCD panel 1, this chuck table 20 is somewhat smaller than the LCD panel 1, and that magnitude is different in the chuck table 2 at the point which the edge of the LCD panel 1 has protruded outside. Moreover, in order to adsorb the LCD panel 1, the adsorption holes 21a, 21b, 21c, and 21d are formed in the center section at the adsorption hole 21 and the mid gear of each area divided into two in all directions, respectively, and as shown in drawing 2 , the XYZtheta migration stage 3 where thetaZ rotation device 3b was accumulated on XY migration device 3a is established in the chuck table 20 at the rear-face bottom of this chuck table 20. In addition, by showing this XYZtheta migration stage 3 in JP,7-83793,A (Japanese Patent Application No. No. 252318 [five to]) which is application by the applicant for this patent, since it is well-known, that detail is already omitted.
[0011] So that the core may be in agreement with the center line Yo of the direction of Y which passes along the adsorption hole 21, if it is located at the core of the chuck table 20, and the XYZ direction is set up so that it may illustrate as an alternate long and short dash line shows the adsorption hole 21 to drawing 1 The edge detection optical sensor (following edge sensor) 6 of the direction of Y is formed so that the edge of the detection location of the LCD panel 1 may correspond with the criteria location (location where the edge of the direction of Y of the LCD panel 1 should be essentially positioned in the direction of Y) of the direction of Y by ****** detached building ******. Moreover, it is prepared so that the edge of the edge sensors 7 and 8 of the direction of X of the LCD panel 1 may correspond with the center line Xo of the direction of X which passes along the adsorption hole 21 by ****** detached building ****** in the criteria location (location where the edge of the direction of X of the LCD panel 1 should be essentially positioned in the direction of X) of the direction of X at the symmetry. Distance of the detection location of these edge sensors 7 and 8 is set to L here. Edge sensors 6, 7, and 8 are attached in the base 9 which is fixing the chuck table 20, respectively. And when each one side of the direction of X of the LCD panel 1 and the direction of Y is in agreement with the detection location of said edge sensor, it comes to be in agreement with the core of the exposure optical system 4 (refer to drawing 2) that the core has been arranged in the upper part at the LCD panel 1, and, thereby, positioning of the LCD panel 1 is completed. Especially, thereby in an aligner, PURIARAIMENTO of the LCD panel 1 is completed.
[0012] The configuration of edge sensors 6, 7, and 8 is that irradiated the laser beam perpendicularly to the field of the LCD panel 1, and the exposure light was intercepted. As the location is detected and an edge sensor 8 is shown in drawing 2 as a representative, these edge sensors The laser light source 11 by the semiconductor device which is arranged in a location higher than the front face of the chuck table 20, and irradiates a beam horizontally, It is arranged in a location lower than the rear face of the up mirror 12 and the chuck table 20 which are horizontal, receive the beam of a laser light source 11, and reflect this perpendicularly. It consists of the lower mirror 13 which reflects this horizontally in response to the beam from the up mirror 12, a photo detector 14 which receives the beam from the lower mirror 13, and a frame 15 of the typeface of KO which supports these.
[0013] The detecting signal of a photo detector 14 is sent out to data processing and a control circuit 17 through the detectors 16, 16, and 16 prepared corresponding to each sensor. It consists of amplifier (AMP) 16a and comparator (COM) 16b to which a detector 16 amplifies the detecting signal of a photo detector 14 as shown in drawing 2 , and comparator 16b generates an edge detecting signal, when the output of amplifier 16a becomes below a reference value. While data processing and a control circuit 17 consist of MPU17a, memory 17b, etc. and receiving an edge detecting

signal from comparator 16b, the signal from the CCD sensor (not shown) of the detection exposure optical system 4 arranged in the upper part of the chuck table 20 for inspection etc. is received. Moreover, the control signal for carrying out specified quantity migration of the XYZtheta migration stage 3 is sent out to the table drive control circuit 18. Migration control program 17c and 17d of location amendment processing programs which control the XYZtheta migration stage 3 are formed in memory 17b.

[0014] Next, positioning processing of the LCD panel 1 is explained according to drawing 3 . First, the chuck table 20 is set as an initial valve position (home position) (step 100). Next, the LCD panel 1 is laid in the chuck table 20, and carries out adsorption maintenance of this (step 101). And migration control program 17c is performed and the chuck table 20 is moved in the direction of X by fixed speed toward edge sensors 7 and 8 (step 102). Next, MPU17a of data processing and a control circuit 17 enters the waiting loop formation for a signal from edge sensors 7 and 8 (step 103). If an edge detecting signal is obtained from either of the edge sensors 7 and 8, according to the edge detecting signal, the movement magnitude of the chuck table 20 at that time will be memorized to the storage location corresponding to the sensor by which the edge detecting signal of memory 17b was obtained. For example, as the movement magnitude from the zero, i.e., an X coordinate value from the zero, if the edge detecting signal was obtained from the edge sensor 7, X1 is memorized to the storage location FX1 of an edge sensor 7 (step 104).

[0015] Next, the waiting loop formation for a signal is again entered from edge sensors 7 and 8 (step 105). An edge detecting signal is obtained from either of the edge sensors 7 and 8 like the above. In this example, the edge detecting signal of an edge sensor 8 is obtained shortly, and the movement magnitude of the chuck table 20 at that time is memorized according to this to the storage location corresponding to the sensor by which the edge detecting signal of memory 17b was obtained (step 106). At this time, from an edge sensor 8, since it is an edge detecting signal, X2 is memorized to the storage location FX2 of an edge sensor 8 as the movement magnitude, i.e., that X coordinate value, from that zero. And the chuck table 20 is returned to an initial valve position (step 107), and the following formula amends a rotation theta.

It asks for theta by theta=arctan {(X1-X2) /L}, and the chuck table 20 is rotated by -theta (step 108). However, L is the distance of an edge sensor 7 and an edge sensor 8. Furthermore, the following formula performs X stem correction. The amount X3 of amendments is calculated by X= (X1+X2) / 2, and the chuck table 20 is moved to X shaft orientations for -X 3 minutes (step 109).

[0016] In the location of the chuck table 20, the chuck table 20 is moved in the direction of Y by fixed speed toward an edge sensor 6 after this X stem correction (step 110). And MPU17a of data processing and a control circuit 17 enters the waiting loop formation for a signal from an edge sensor 6 (step 111). If the edge detecting signal was obtained from the edge sensor 6, Y1 is memorized to the storage location FY1 of an edge sensor 6 as the movement magnitude, i.e., the Y coordinate value, from the zero (step 112). And the chuck table 20 is moved to Y shaft orientations as Y stem correction for -Y 1 minute (step 113). It means that the location for which it asked by the above turns into an original home position, and the LCD panel 1 was positioned for the core of the LCD panel 1 in accordance with the core of the exposure optical system 4 (PURIARAIMENTO).

[0017] Drawing 4 is the example of the chuck table which can also position the LCD panel 1 smaller than the magnitude of the chuck table 20. Chuck table 20a According to the size of the small LCD panel 1, the long holes 22a and 22b of the direction of X for passing the beam of edge sensors 6, 7, and 8 and the long holes 22c and 22d of the direction of Y are formed along each side of X and the direction of Y, respectively. When the die length of the long holes 22a and 22b of the direction of X considers a forward negative direction, it is a twice [more than] as many thing as the maximum of the amount of amendments of a Y-axis, and long holes [of the direction of Y / 22c and 22d] die length is a twice [more than] as many thing as the maximum of the amount of amendments of the X-axis similarly. Moreover, as shown in drawing 2 , since eight are the typeface of edge sensors 6, 7, andKO, the beam for edge detection can enter to an aforementioned long holes [22a-22d] location. Or the die length of the arm part by the side of the tip of the character of KO has become [the up mirror 12 and the lower mirror 13] for a long time so that may be supported, so that it may be made.

[0018] In the example, although explained above, although edge sensors 6, 7, and 8 are considered as immobilization, it can combine with a migration device and edge sensor 6 and 7 and 8 side can be moved for chuck table 20a to a zero in the state of immobilization so that these may be moved in accordance with each shaft. Thereby, each coordinate value X1, X2, and Y1 may be obtained. In addition, when moving a sensor side in this way, these values can also be acquired to coincidence and, thereby, the time amount of amendment processing is shortened. Moreover, although a sensor here makes a light beam penetrate and detects an edge by cutoff of the beam, a sensor which detects the scattered reflection light of an edge by the photo sensor of a reflex can also be used for it. Furthermore, X in an example and Y are relative and the direction of X and the direction of Y may be replaced.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is a top view centering on the chuck table of the exposure stage of the large-sized LCD panel of one example which applied the positioning device of the substrate of this invention.
[Drawing 2] Drawing 2 is the side elevation of the chuck table of the inspection stage for large-sized LCD panels of drawing 1 .
[Drawing 3] Drawing 3 is the flow chart of the positioning processing for LCD panels.
[Drawing 4] Drawing 4 is the top view of the small chuck table for LCD panel positioning.
[Drawing 5] It is the top view of the conventional chuck table of the inspection stage for large-sized LCD panels.
[Drawing 6] It is an explanatory view about an include-angle gap of the conventional chuck table.
[Description of Notations]
1 -- 2 A large-sized LCD panel, 20 -- Chuck KUTEBURU,
3 -- A XYZtheta migration stage, 4 -- Optical system,
6, 7, 8 -- An edge sensor, 9 -- Base,
11 -- A laser light source, 12 -- An up mirror, 13 -- Lower mirror,
14 -- A photo detector, 16 -- Detector,
17 -- Data processing and control circuit,
17 a--MPU, 17b -- Memory,
17c -- A migration control program, 17d -- Location amendment processing program,
18 -- Table drive control circuit.

[Translation done.]

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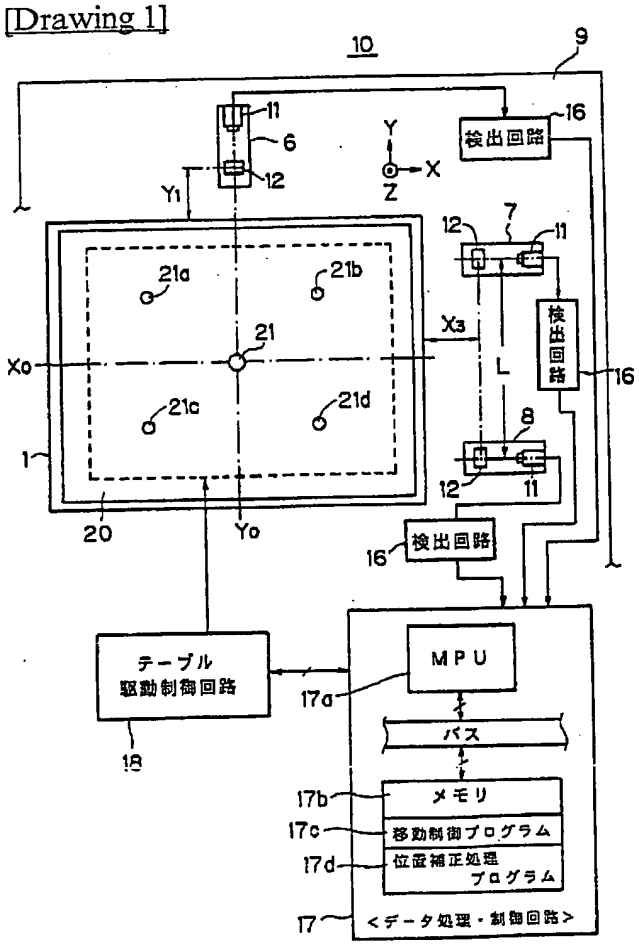
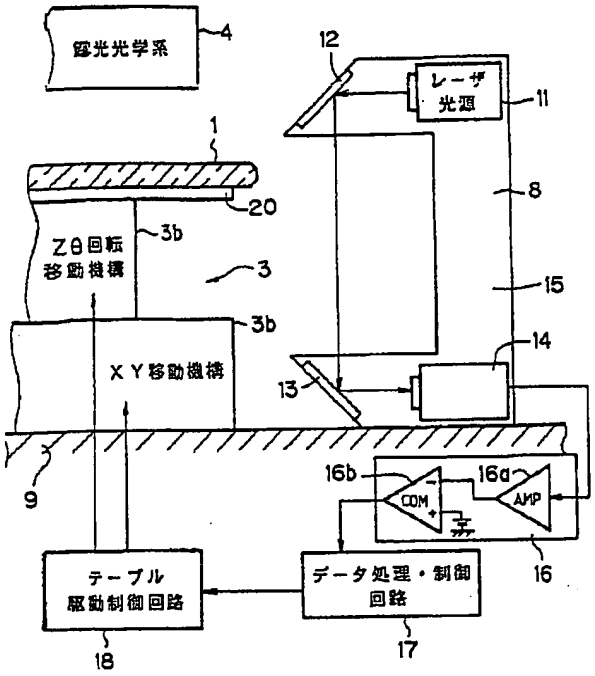
DRAWINGS

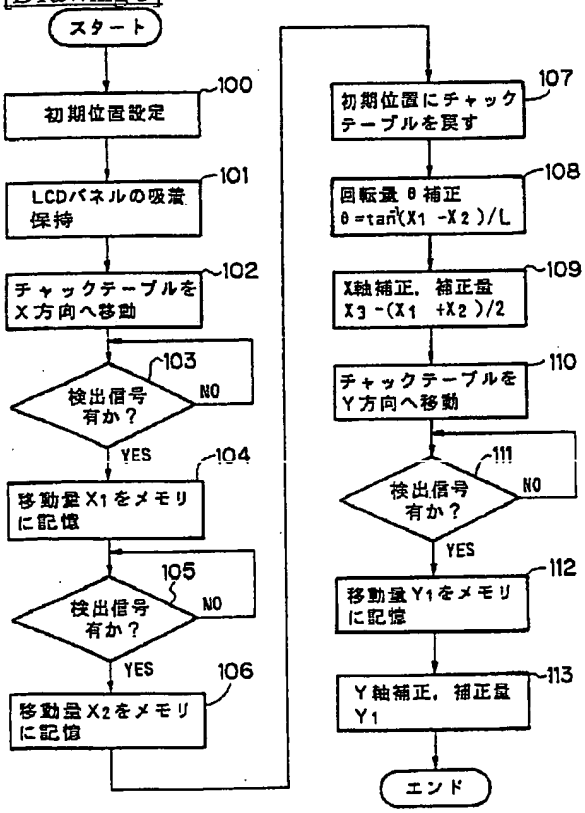
[Drawing 1]



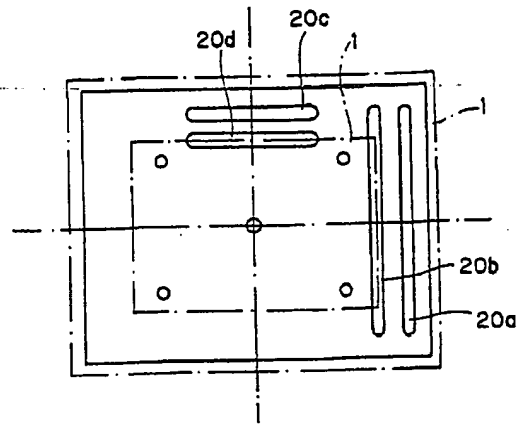
[Drawing 2]



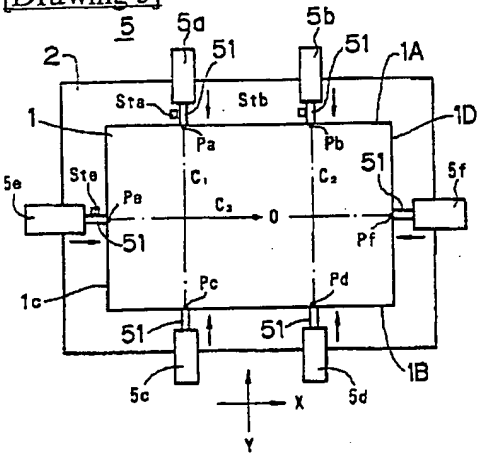
[Drawing 3]



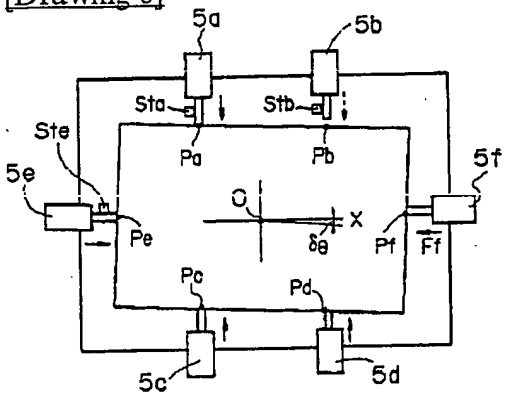
[Drawing 4]



[Drawing 5]



[Drawing 6]



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